

IN THE CLAIMS

Please amend the claims as follows:

Claim 1 (Currently Amended): A liquid-mixing apparatus for producing a liquid mixture obtained by mixing two or more liquid components, a liquid mixture obtained by mixing a liquid component and a gas component, a liquid mixture obtained by mixing a liquid component and a powder component, or a combination of some of the liquid mixtures mentioned above, the liquid-mixing apparatus comprising:

a vessel for storing the mixture components, the vessel having a recess formed to a bottom portion wall thereof;

a vibrator disposed in the vessel and having at least one surface with a predetermined area contacting the mixture components;

a high-frequency vibration generator, connected to the vibrator, for vibrating the vibrator at high frequency in a direction perpendicular to said one surface;

a reflector detachably disposed in the recess in the recess of the bottom portion wall of the vessel to be detachable, [[said]] the reflector being arranged with a spaced space from the vibrator at a small distance of 10 mm or less so that [[said]] the surface of the vibrator contacting the mixture components faces a surface of the reflector, and said reflector reflecting high-frequency vibration transmitted from the vibrator to create reflected waves in the mixture components flowing between the facing faces; and

a drain pipe provided for a side wall of the vessel for draining the liquid mixture component,

wherein the vessel is provided with one or more perforations as inlet ports which extend through a center area of the reflector and penetrate the bottom portion of the vessel, and through which the mixture components are fed to a space between the vibrator and the reflector through a mixture component supply line connected to the perforation,

the vibrator and the reflector cooperate to create cavitation bubbles in the mixture components utilizing a decompression action of the vibrator allowed to move away from the reflector by the high-frequency vibration transmitted from the high-frequency vibration generator to the vibrator and also cooperate to break the cavitation bubbles utilizing the compression action of the vibrator allowed to move toward the reflector,

shock wave energy generated by the breaking action extremely reduces the size of the cavitation bubbles and promotes the diffusion of the mixture components, so that the liquid mixture is allowed to have an ultra fine particle size and high density, and

at least one of a surface of the vibrator that faces the reflector and a surface of the reflector that faces the vibration vibrator has a large number of bottomed pits which are cone-  
shape in section ~~cone-shaped~~ pits for generating shock waves, the shock waves generated in the pits are converged on focal sections existing between the vibrator and the reflector, and the focal section form an ultra strong shock wave-generating zone existing between the vibrator and the reflector.

Claim 2 (Original): The liquid-mixing apparatus according to claim 1, wherein the high-frequency vibration transmitted from the high-frequency vibration generator to the vibrator has an ultrasonic frequency.

Claim 3 (Canceled).

Claim 4 (Original): The liquid-mixing apparatus according to claim 1, wherein the high-frequency vibration generator includes a ceramic piezoelectric vibrating member or a vibrating member composed of a super magnetostriictive material or a magnetostriictive

material and the vibrator is provided with the reflector or connected to the reflector with a space present therebetween.

Claim 5 (Original): The liquid-mixing apparatus according to claim 1, wherein the vibrator has a surface section, and the reflector has a surface section facing the surface section of the vibrator, and at least one of these surface sections contains a hard material resistant to cavitation damage caused by the cavitation bubbles.

Claims 6-12 (Canceled).

Claim 13 (Withdrawn): A liquid-mixing method of producing a liquid mixture obtained by mixing two or more liquid components, a liquid mixture obtained by mixing a liquid component and a gas component, a liquid mixture obtained by mixing a liquid component and a powder component, or a combination of some of the liquid mixtures mentioned above, the liquid-mixing method comprising the steps of:

storing the mixture components in a vessel including a vibrator vibrating at high frequency and a reflector spaced from the vibrator at a small distance;

creating cavitation bubbles in the mixture components flowing between the vibrator and the reflector utilizing a decompression action of the vibrator allowed to move away from the reflector by high-frequency vibration transmitted from the high-frequency vibration generator to the vibrator;

breaking the cavitation bubbles utilizing the compression action of the vibrator allowed to move toward the reflector;

reducing the size of the cavitation bubbles with shock wave energy generated due to the compression action; and

promoting the diffusion of the mixture components to allow the liquid mixture to have an ultra fine particle size and high density.

**Claim 14 (Withdrawn):** The liquid-mixing method according to claim 13, wherein when two or more liquid components are used, in which one of the liquid components is a fuel oil, a gas oil, a waste oil, or a waste edible oil and another one is at least one selected from the group consisting of an oil other than the above oil, alcohol, a solvent other than alcohol, and water, said components being mixed into an liquid fuel.

**Claim 15 (Withdrawn):** The liquid-mixing method according to claim 13, wherein when a liquid component and a gas component are used, the liquid component is an edible oil or an fatty oil which contains at least one of a liquid additive and a liquid perfume and the gas component is air, said components being mixed into a creamy food product, a cosmetic product, or a drug product.

**Claim 16 (Withdrawn):** The liquid-mixing method according to claim 13, wherein when a liquid component and a powder component are used, the liquid component is an industrial ingredient, a food ingredient, a cosmetic ingredient, or a drug ingredient, and the powder component is a fine ceramic powder, a fine food powder, a fine cosmetic powder, or a fine drug powder which contains an additive, said components being mixed into an industrial liquid material, a food product, a cosmetic product, or a drug product.

**Claim 17 (Canceled).**

Claim 18 (Previously Presented): A liquid-mixing apparatus for producing a liquid mixture obtained by mixing two or more liquid components, a liquid mixture obtained by mixing a liquid component and a gas component, a liquid mixture obtained b mixing a liquid component and a powder component, or a combination of some of the liquid mixtures mentioned above, the liquid-mixing apparatus comprising:

- a vessel for storing the mixture components;
- a vibrator disposed in the vessel and having at least one surface with a predetermined area contacting the mixture components;
- a high-frequency vibration generator, connected to the vibrator, for vibrating the vibrator at high frequency in a direction perpendicular to said surfaces;
- a reflector detachably disposed on a bottom portion of the vessel, said reflector being spaced from the vibrator at a distance 10 mm or less so that said surface of the vibrator contacting the mixture components faces a surface of the reflector, and said reflector reflecting high-frequency vibration transmitted from the vibrator to create reflected waves in the mixture components flowing between the facing faces; and
- a drain pipe provided for the vessel for draining the mixture component, wherein the vessel is provided with one or more perforations which extend through a center area of the reflector and penetrate the bottom portion of the vessel, and through which the mixture components are fed to a space between the vibrator and the reflector through a mixture component supply line connected to the perforation,
- the vibrator and the reflector cooperate to create cavitation bubbles in the mixture components utilizing a decompression action of the vibrator allowed to move away from the reflector by the high-frequency vibration transmitted from the high-frequency vibrations generator to the vibrator and also cooperate to break the cavitation bubbles utilizing the compression action of the vibrator allowed to move toward the reflector,

shock wave energy generated by the breaking action extremely reduces the size of the cavitation bubbles and promotes diffusion of the mixture components, so that the liquid mixture is allowed to have an ultra fine particle size and high density, and

at least one of a surface of the vibrator that faces the reflector and a surface of the reflector that faces the vibrator has a large number of cone-shaped pits for generating shock waves, the shock wave generated in the pits converges on focal sections existing between the vibrator and the reflector, and the focal sections form an ultra strong shock wave-generating zone existing between the vibrator and the reflector.